

Some Thoughts Regarding Obesity

The clinician who concerns himself with nutritional and metabolic problems is confronted by many individuals whose presenting problem is that of excess weight. A fairly high percentage of such patients have convinced themselves, or have been convinced by others, that their obesity is "glandular," and that all the physician needs to do is to unravel their complex "glandular disorder," prescribe the necessary pill, and all will be well. The physician in turn is apt to be rather certain in his own mind that the patient has no endocrinopathy, and is obese for the good and sufficient reason that he or she consumes an excessive amount of food. In terms of fundamentals, there is no question that the latter analysis is correct.

The tendency on the part of most capable physicians is to approach an obese patient about as follows:

1. Patient, Mary Smith, is obese.
2. Therefore, patient Mary Smith eats excessively.
3. Patient Mary Smith, on the basis of her height and average daily activity, has a total daily caloric requirement of 1800 calories.
4. Therefore, patient Mary Smith if placed on a diet containing 1000 calories will lose at a predictable rate.
5. If patient Mary Smith fails to lose at the aforesaid predictable rate, she is "cheating."

The foregoing logic on the surface appears to be irrefutable. Unfortunately (in a clinical sense), there appear to be certain flaws. The majority of Mary Smiths who fit into a category similar to the above *will* lose weight at a predictable rate when placed on a diet, the caloric content of which is significantly below that of their estimated daily requirements. In a certain number, however, the dietary calories must be not only below the theoretical requirement, but rather startlingly below such a figure.

Illustrative of this is a study carried out under quantitatively controlled conditions on the metabolic ward in this Institute more than two years ago.¹ A young obese girl was

admitted to the metabolic ward for evaluation, with a story of obesity unresponsive to the usual dietary measures. Her dietary history indicated a more than average enjoyment of food, and a relatively high caloric intake in childhood. It was our feeling, therefore, that her alleged unresponsiveness to specific diets was actually a matter of never having adhered to a prescribed diet. She was placed on a quantitatively constant formula diet, administered hourly throughout the 24 hours via nasogastric tube. On an 800 calorie diet, after some initial weight loss, she progressively approached weight equilibrium. After a period of additions of increments of fat (to determine the antiketotic properties of protein), the diet was reduced to 600 and finally to 400 calories.

At the 400 calorie level, if all the diet was derived from protein, minimal weight loss occurred. If all the 400 calories were derived from carbohydrate or carbohydrate plus fat, rapid weight loss occurred. During the intake of 400 protein calories, the patient was in positive nitrogen balance in an amount averaging more than one gram daily. With the 400 calorie carbohydrate, or carbohydrate-fat intake, she was in negative nitrogen balance in an amount averaging about four grams per day. These findings are shown in Figure 1. Three other similar patients have been studied under semi-quantitatively controlled conditions since that time, and have appeared to follow much the same pattern.

One is able to explain the above observations on the basis of one or both of two assumptions:

1. The first assumption is that some individuals have an unusual ability to conserve protein; i.e., the average individual receiving only 400 calories daily, even though all of it be in the form of protein, will not be in nitrogen equilibrium. Since this patient was receiving no carbohydrate, and after the first few days had exhausted all of her endogenous carbohydrate stores, one must conclude that she had the ability to catabolize fat with a



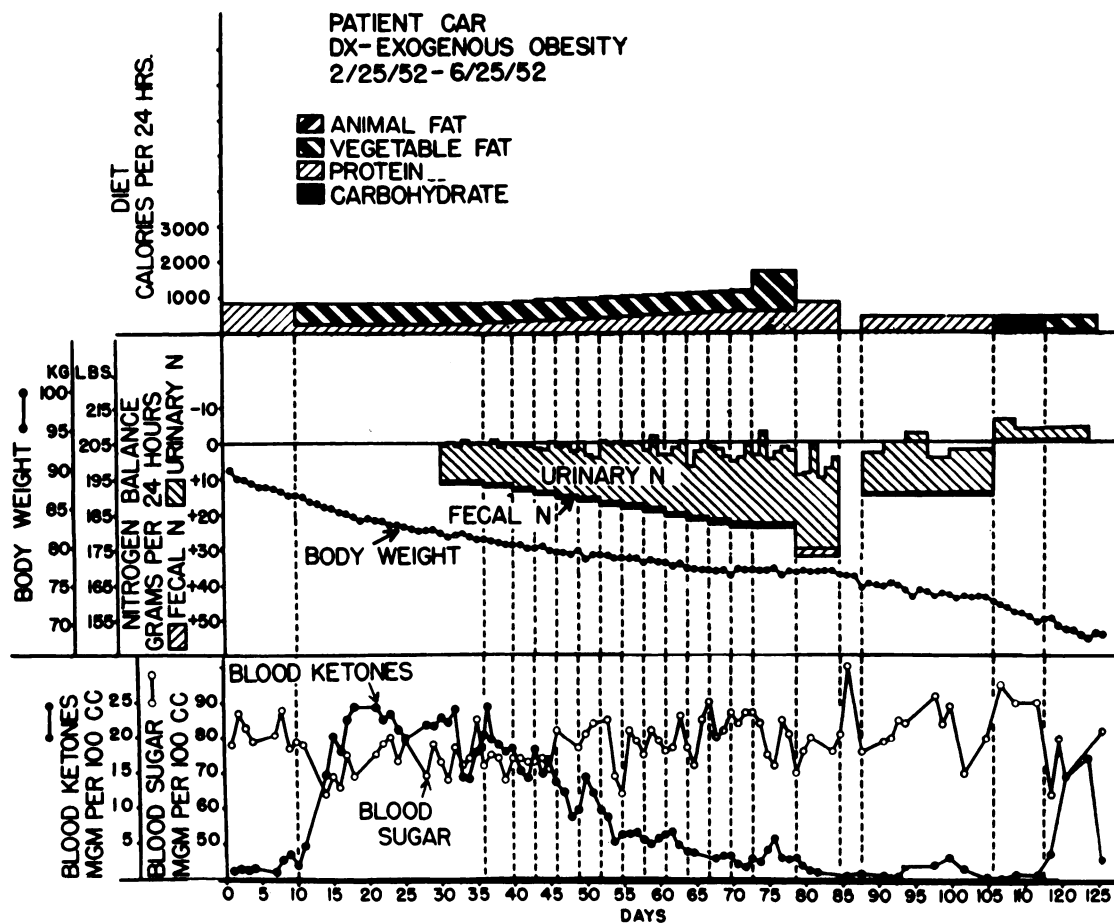


Fig. 1. Long-term balance in an obese individual. The weight and nitrogen balance changes during days 87-124 are of particular interest from the standpoint of this discussion.

high degree of efficiency, with consequent protein conservation. Since protein tissue is 80 per cent hydrated, and, therefore, has a caloric equivalence of approximately one caloric per gram, and fat tissue is 10 per cent hydrated and has a caloric equivalence of about eight calories per gram (Figure 2), this patient (whose calculated daily caloric requirement was 1700 calories) should have lost approximately 130 grams per day while receiving 400 protein calories. She actually lost 150 grams per day, the difference, presumably, being attributable to salt and water loss. Such a patient, if she conserved protein with equal efficiency on a pure protein diet having an 800 caloric equivalence, could actually *gain* weight until her own fat stores were exhausted.

2. The second assumption is that the net

mechanical efficiency of the body may vary appreciably between individuals. In this connection, one might point out the very obvious difference in heat loss during physical exertion in the trained athlete as compared to the average office worker. Benedict and Cathcart,² reviewing the subject of mechanical efficiency of the animal body, noted that in their subjects, average net efficiency might vary from 20.4 to 25.2 per cent. One does not need to invoke such an assumption in the patient noted above.

The above comments are not intended to suggest for a moment that the mainstay of the clinical approach to weight reduction is not the use of a simple, relatively high protein, low caloric diet. They are rather to point out that there are endogenous factors, as yet by

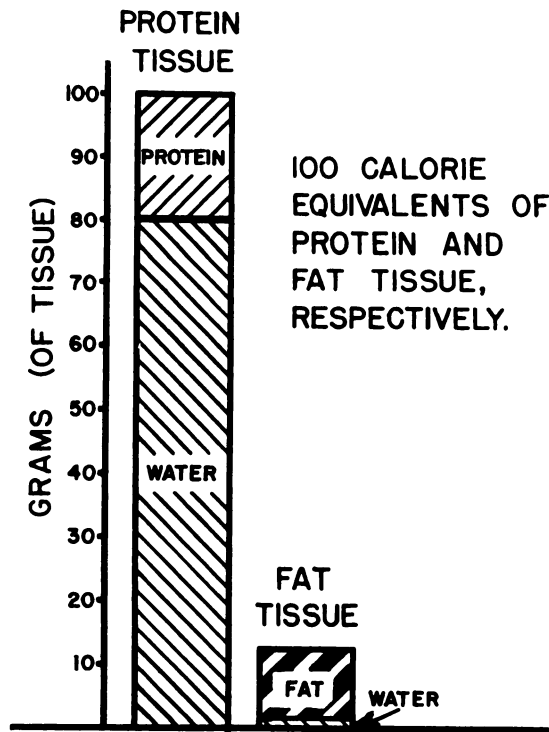


Figure 2

no means well understood, which on occasion will enable two individuals of approximately the same size and age, having "normal metabolic rates," and indulging in about the same amount of daily activity, to move in different directions in regard to weight, even though their food consumptions be identical; and further to point out that "a calorie is not necessarily a calorie" insofar as weight reduction is concerned; i.e., the qualitative make-up of a diet, as well as its caloric equivalence, may influence in a major way the pattern of weight change.

—LAURANCE W. KINSELL, M.D.
Institute for Metabolic Research
of the Highland Alameda County
Hospital, Oakland, California

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